

Area of impact: Science and the environment

5. David Hanson, Chief Executive of *Hanson Robotics Inc*, is a leader in creating robots that are among the most advanced in the world. He has created Jules, an example of a “social robot” that uses artificial intelligence, integration of natural language processing, automatic speech recognition and text-to-speech. It is possible to have a natural, interactive conversation with Jules. Frubber is an elastic material that has been developed by *Hanson Robotics Inc* which looks like natural skin and makes Jules’ realistic facial movement and speech possible.

Jules also uses “computer vision” through a device in his eye which captures the image of the person talking to him. “Computer vision” includes face recognition and face tracking to simulate complete verbal and non-verbal interaction, such as maintaining eye contact and turning the head to follow the movement of the human to whom Jules is talking.

David Hanson also teaches his robots their history, vocabulary, and develops their basic “personality”, either based on a real person or an imaginary character. Hanson’s robots have been used in games and toys, research and psychiatry scenarios, military training and animations.



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- (a) Identify **two** input devices that are required in order for Jules to interact with a real person. [2 marks]
- (b) Describe the steps that Jules would take in order to follow the movement of the person talking to him. [4 marks]
- (c) Jules may have difficulty understanding a sentence in a conversation with a human. Explain why this could happen. [4 marks]

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(Question 5 continued)

- (d) The organizers of an important tennis tournament are considering using a robot similar to Jules, named Tennis-Umpire, for the purpose of umpiring some of the games. This robot, which remains seated throughout the match, uses its own cameras to analyse the game and then communicates its decisions to the human spectators using speech.



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Evaluate whether the organizers should go ahead with this decision to replace human umpires with robotic umpires such as Tennis-Umpire.

[10 marks]